**Washington State
Department of Transportation**

2007 **WSDOT
Greenhouse
Gas Emissions
Inventory**

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16. ABSTRACT

This is the Washington State Department of Transportation's (WSDOT) first greenhouse gas (GHG) emission inventory. This inventory reports greenhouse gas emissions released through agency activities in 2007 and was prepared to help the agency better understand its emissions.

This inventory includes only emissions released by the agency and does not include emissions released by the public traveling on the state highway system. Those emissions are captured in the Washington State Greenhouse Gas Inventory prepared by the Washington State Department of Ecology.

The 2008 Washington State Legislature passed climate change legislation that included mandatory greenhouse gas reporting requirements (RCW 70.94.151). WSDOT emissions are above the thresholds and will be required to report emissions. These reporting requirements take effect with 2009 emissions to be reported in 2010. This inventory is the agency's first step in establishing the internal processes needed to meet upcoming reporting requirements.

The inventory follows The Climate Registry's *General Reporting Protocol* to the extent feasible and includes greenhouse gas emissions from the ferry system, the highway system (traffic services), agency buildings, and the agency's vehicle fleet. However, rather than basing the inventory on actual utility use, as required by The Climate Registry, utility use was estimated from utility payment information due to of the large number of accounts and difficulty consolidating the data.

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EXECUTIVE SUMMARY

This is the Washington State Department of Transportation's (WSDOT) first greenhouse gas (GHG) emission inventory. This inventory reports greenhouse gas emissions released through agency activities in 2007 and was prepared to help the agency better understand its emissions.

What were WSDOT's greenhouse gas emissions in 2007?

In 2007 WSDOT emitted approximately 265,000 metric tons (MT) carbon dioxide equivalents (CO_2e). Exhibit 1 shows the agency's total emissions. Exhibit 2 shows the proportion of emissions from different activities of the agency.

Exhibit 1: Total Emissions

Source	Emissions (MT CO_2e)
Ferry Fleet	181,321
Vehicle Fleet	36,837
Facilities[1]	13,762
Ferry Shore-side Operations[2]	5,580
Traffic Services [3]	27,186
Total	264,686

Exhibit 2: Emissions by Category
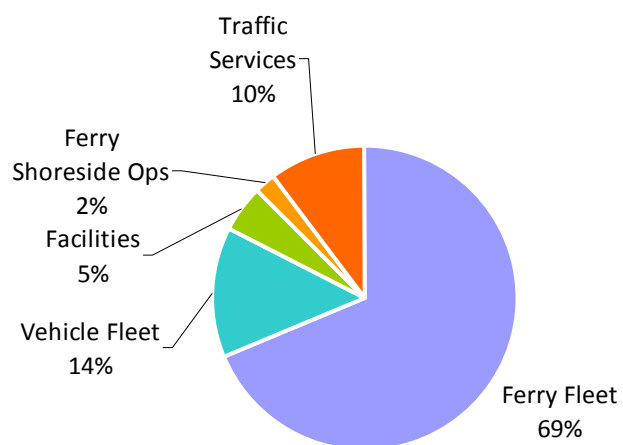
WSDOT's emissions are primarily from the ferry fleet, vehicle fleet, buildings, and highway system. WSDOT runs the country's largest ferry fleet, providing access across Puget Sound, to British Columbia, and to a number of islands. In addition to the vessels, the ferry system operates terminals and office buildings. The agency's vehicle fleet includes a wide range of vehicle types – from passenger vehicles to snow plows and other specialty equipment. Facility emissions come from utility use in over 1,030 buildings and structures: storage sheds, radio shacks, maintenance facilities, and office buildings. Traffic services includes electricity use for traffic lights, street lights, and rest areas.

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[1] Includes subprograms OR, C1, D4, E1, F1, F2, F3, I1, I2, I3, I4, I6, I7, P1, P2, P3, P4, P5, P7, P8, P9, Q2, S2, T2, Z2. See appendix for subprogram names.
[2] Includes subprograms X1, X2, X7. See appendix for subprogram names.
[3] Includes subprograms M1, M2, M3. See appendix for subprogram names.

This inventory includes only emissions released by the agency and does not include emissions released by the public traveling on the state highway system. Those emissions are captured in the Washington State Greenhouse Gas Inventory prepared by the Washington State Department of Ecology.

How was this emissions inventory calculated?

The inventory follows The Climate Registry's (The Registry) *General Reporting Protocol* (Protocol) to the extent feasible and includes greenhouse gas emissions from the ferry system, the highway system (traffic services), agency buildings, and the agency's vehicle fleet. However, rather than basing the inventory on actual utility use, as required by The Registry, utility use was estimated from utility payment information due to of the large number of accounts and difficulty consolidating the data. Only utilities paid directly by WSDOT were included; utilities included in rent payments for leased space are not included in this report. Work is underway to determine how best to include utility use not paid directly by the agency for future reports.

Where do we go from here?

The 2008 Washington State Legislature passed climate change legislation that included mandatory greenhouse gas reporting requirements (RCW 70.94.151). Owners of vehicle fleets emitting over 2,500 metric tons of carbon dioxide equivalents

WSDOT's operates the largest ferry system in the nation, making it the agency's primary source of greenhouse gas emissions.

(CO_2e) and entities emitting over 10,000 MT CO_2e in total will be required to report emission. Exhibit 3 compares these regulatory thresholds with WSDOT emissions, which are over both of these thresholds. These reporting requirements take effect with 2009 emissions to be reported in 2010. The Washington State Department of Ecology (Ecology) is currently in the rulemaking process for this requirement.

Exhibit 3: WSDOT Emissions and Mandatory Reporting Thresholds

Source	WSDOT Emissions (MT CO₂e)	Reporting Requirement Threshold (MT CO₂e)
Vehicle Fleet	36,837	2,500
Agency Total	264,686	10,000

In addition to the mandatory reporting requirements, WSDOT joined The Registry as a founding member to report agency 2009 emissions in 2010. Ecology will be using The Registry's Protocol

and reporting system for mandatory reports, thus, reporting through The Registry will also meet state requirements.

Washington State is participating in the Western Climate Initiative, a collaborative of seven US states and four Canadian provinces developing a regional greenhouse gas cap and trade program. Within the state, there is discussion regarding the possibility of changing the entity-wide 10,000 MT CO_2 threshold to more closely match the threshold in the Western Climate Initiative draft design. This change could reduce WSDOT's reporting requirement.

As mentioned above, this inventory did not fully follow the requirements of The Registry. In order to adequately meet the rigorous standards of The Protocol, actual, not estimated, utility use data will need to be gathered. WSDOT does not currently track this data in a comprehensive manner. Several outstanding questions need to be addressed:

- How can the agency effectively and efficiently collect the data needed to prepare an inventory that meets the requirements set by The Protocol?
- Will RCW 70.94.151 reporting requirement be modified? This will be determined by Ecology and the Washington State Legislature.
  - o If the reporting requirement is changed, will that affect what WSDOT is required to report? If the reporting requirement is changed, WSDOT staff will evaluate how the changes affect the agency.
  - o If WSDOT's reporting requirements change, how does the agency want to address future emissions? If the reporting requirement reduces what WSDOT is required to report, agency executives will need to decide what additional emissions the agency will voluntarily report and how these emissions will be reported.

INTRODUCTION

Why is WSDOT reporting its greenhouse gas emissions?

The Washington State Department of Transportation (WSDOT) is looking at the greenhouse gases it emits to better understand the agency's contribution to climate change. While the agency is actively working to reduce emissions from the state's transportation sector, it is also looking for ways to reduce agency operational emissions. Reducing emissions will provide environmental benefits, and may reduce WSDOT's operating costs.

The 2008 Washington State Legislature established a mandatory reporting requirement (RCW 70.94.151), which requires all entities with annual vehicle fleet emissions over 2,500 metric tons of carbon dioxide equivalents (MT CO_2e) or total annual emissions over 10,000 MT CO_2e to report their emissions every year. WSDOT exceeds both of these thresholds. This requirement begins with 2009 emissions, which must be reported in 2010. The Washington State Department of Ecology is currently writing the rule for this requirement. These thresholds may change to more closely reflect the requirements outlined in the Western Climate Initiative (WCI) draft design. The WCI is a collaborative of 7 US states, including Washington, and 4 Canadian provinces that are developing a regional greenhouse gas cap and trade program.

In May 2008, WSDOT joined The Climate Registry as a founding member and committed to reporting our 2009 emissions through their system in 2010. Reporting through The Registry will also satisfy the state reporting requirement.

How will this report be used?

This inventory provides information on where the agency's emissions come from and may form the basis of our emission reduction efforts. In this capacity, the report will also serve as a baseline to compare future emissions and track the effects of changes made over time.

By going through the emissions inventory process two years before reporting requirements take effect the agency will be better able to meet the requirements when they take effect. While preparing this inventory, challenges and data gaps have been noted so that solutions can be developed to meet the coming requirements.

What is an emissions inventory?

An emissions inventory is an accounting of emissions released by an organization during a specific time period, generally one year. Similar to financial accounting, an emissions inventory looks at the past and reports what happened. Unlike the environmental analyses WSDOT prepares for transportation projects, which estimate future impacts, an inventory describes what happened in the past.

Also similar to financial accounting, greenhouse gas reporting follows specific rules and guidelines. In this case, The Climate Registry's *General Reporting Protocol* provides the guidelines for preparing a greenhouse gas inventory.

What is The Climate Registry?

The Climate Registry (The Registry) is a non-profit partnership of 40 US states, 12 Canadian provinces, six Mexican states, and three Native American nations. The organization was created to develop and manage a greenhouse gas emissions registry in North America and will serve as a central repository of greenhouse gas emissions data. Washington State Department of Ecology represents Washington State on The Registry's Board of Directors.

What is the *General Reporting Protocol*?

The Registry's *General Reporting Protocol* (Protocol) is the guidance document that specifies the requirements for performing a greenhouse gas emissions inventory. The Protocol details how to calculate and report emissions. Following the procedures outlined in The Protocol is required when reporting through The Registry.

The Registry developed "an accurate, complete, consistent and transparent greenhouse gas emissions measurement protocol that is capable of supporting voluntary and mandatory greenhouse gas emission reporting policies for its Members and Reporters. It will provide a verified set of greenhouse gas emissions data from its Reporters supported by a robust accounting and verification infrastructure."[4]

The Protocol is based on principles and goals identified by The Registry as fundamental to the inventory process:

- **Create a common standard** for measuring and tracking greenhouse gas emissions. Emitters and policy makers benefit from the standardization of emissions reporting, reduction measurement and the establishment of a common carbon currency.
- **Standardize best practices** in greenhouse gas emissions reporting. The World Resources Institute and the World Business Council for Sustainable Development greenhouse gas Protocol Corporate Standard has already established internationally-recognized standards for greenhouse gas accounting at the entity-level. The Registry operationalizes these standards.
- **Promote full and public disclosure** of greenhouse gas emissions. The Registry will ensure that greenhouse gas emissions data is made available to the public through annual reports posted on the Registry's website.

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[4] http://www.theclimateregistry.org/index.html, accessed 5/27/08.

- **Lower policy implementation costs** for states, provinces and territories, Native Sovereign Nations and Members. Highest savings will come from standard measurement and reporting protocols, a common software platform, and centralization of technical expertise and support.
- **Establish a common infrastructure** to support current and future mandatory reporting programs. The Registry will develop a greenhouse gas emissions reporting system to help support and link state-mandated greenhouse gas emissions reporting programs.[5]

What does the *General Reporting Protocol* require?

Prior to preparing an emissions inventory The Protocol requires the reporter to clearly identify the organization and type of control. The Protocol requires facility level reporting, with some exceptions; defines the gases to report; and provides emission factors to use. The final step in reporting through The Registry is verification. The topics below describe elements of the inventory process and how they apply to WSDOT.

Entity

An entity is the organization reporting emissions. The Registry requires reporting entities to be legally recognized organizations. For WSDOT's inventory, WSDOT is the reporting entity.

Geographic boundaries

The organizational boundaries distinguish the entity for purposes of the inventory. For multi-state or international business there can be numerous decisions to make regarding boundaries.

As a state agency, WSDOT's boundaries are quite simple to determine. Nearly all of the agency's emission sources are located within the state. Ferries running to British Columbia and occasional vehicle use in neighboring states are the only out of state emissions. These emissions are a minor portion of the agency's emissions and are included in this inventory even though they may result in over-reporting. This approach provides a clear picture of all the agency's emissions.

Control

After setting the boundaries, the form of control must be determined. The Registry offers two control strategies: financial and operational. Financial Control means having the ability to direct the financial policies of the operation with an interest in gaining economic benefits from its activities. Operational Control requires having the authority to introduce and implement operating policies.

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[5] http://www.theclimateregistry.org/principles.html, accessed on 10/31/08.

Similar to setting boundaries, control for complex business structures can involve numerous decisions. However, for a relatively simple business structure such as a state agency, The Registry recommends the operational control approach.

WSDOT will report emissions from those sources the agency has operational control over.

Facility-level reporting

The Protocol requires reporting at the facility level. Facilities are defined as single physical premises. However, The Registry recognizes that not all sources are easily definable in this way, so some aggregation of sources is allowed. The Protocol specifically calls out vehicle fleets as one of these facility categories and allows for aggregation of the fleet as a facility.

This inventory will aggregate our vehicle fleet according to the equipment classes used by WSDOT's Transportation Equipment Fund.

Gases

The Registry's Protocol requires reporting for the six gases regulated under the Kyoto Protocol:
1. Carbon dioxide (CO_2)
2. Nitrous oxide (N_2O), also know as laughing gas
3. Methane (CH_4), principal component of natural gas
4. Hydrofluorocarbons (HFC), coolant, flame retardant, and extinguishant
5. Perfluorocarbons (PFC), medical and industrial uses because of its non-reactive nature
6. Sulfurhexafluoride (SF_6), used primarily as an insulator in electrical equipment

This inventory reports the first three gases. The agency also emits small quantities of hydrofluorocarbons and perfluorocarbons and these gases will be included in future inventories.

Emissions

The Protocol identifies three scopes of emissions:

Scope 1: all direct emissions, such as those released from a tailpipe or smokestack

Scope 2: only the indirect emissions from purchased energy (primarily electricity)

Scope 3: all other indirect emissions – those emissions released by someone else in the production of a good (e.g., paper) or service (such as an airline flight) used by the reporter

The Protocol requires reporting all scope 1 and scope 2 emissions. Under this protocol, reporting scope 3 emissions is optional.

This report accounts for scopes 1 and 2 emissions. WSDOT does not collect the data needed to report scope 3 emissions at this time.

Emission factors

The Protocol provides emission factors to use for each gas based on the fuel source and equipment. All emission factors used in this inventory come from The Protocol.

Verification

To ensure accurate accounting of emissions, the protocol requires verification of the report. Verification is done by a third party, accredited according to International Standards Organization (ISO) standards. The first group of verifiers has recently been certified.

This 2007 emissions inventory is not being submitted to a reporting organization and, therefore, will not be verified. Likewise, WSDOT anticipates preparing an inventory of 2008 emissions, and it, too, will not be verified.

Future inventories will require verification to meet state requirements.

How are we reporting our 2007 greenhouse gas emissions?

WSDOT's 2007 emissions are documented in this report. To the extent possible, this report follows The Protocol. However, due to limitations in data collection tools, the methodology underlying this report differs from The Protocol. All deviations from The Protocol are carefully noted in the Methodology section. In addition, challenges and data gaps are identified and potential solutions are discussed in the Next Steps section.

Who can I contact for more information?

For more information about this report, the analysis, and future reporting needs, please contact Karin Landsberg, 206-440-4521, landsbk@wsdot.wa.gov.

For more information about WSDOT's Climate Change Program, contact Anne Criss, 360-705-7909, crissa@wsdot.wa.gov.

For more information about WSDOT's internal emissions reductions efforts, please contact Seth Stark, 360-705-7913, starks@wsdot.wa.gov.

METHODOLOGY

What are WSDOT's sources of greenhouse gas emissions?

WSDOT's greenhouse gas emissions come from five categories of sources:

- Ferry fleet
- Ferry shore-side operations (emissions from energy use at ferry terminals, office buildings, etc.)
- Vehicle fleet
- Facilities (buildings)
- Traffic services (traffic lights, street lights, rest areas)

The ferry system operated 27 ferries in 2007, mostly in the Puget Sound area.

Ferry fleet and operations

The Seattle metropolitan area sits on the Puget Sound a network of inland waterways connected to the Pacific Ocean by the Strait of Juan de Fuca. Because of this unique landscape, WSDOT operates the nation's largest ferry system carrying 23 million passengers and 11 million vehicles annually across 200 miles of marine highway. In 2007, the ferry system's 27 vessels provided 450 daily sailings on its 10 routes from Pt. Defiance, Tacoma in the south, to Sidney, British Columbia in the north. WSDOT operates 20 terminal facilities which use energy for heat and light. The ferries burn diesel fuel, which primarily releases carbon dioxide, but also releases small amounts of nitrous oxide and methane.

The ferry system is pursuing several initiatives that will reduce fuel consumption and emissions including the recently completed biodiesel pilot test.

Vehicle fleet

Greenhouse gas emissions from the agency's vehicle fleet come from burning gasoline and diesel fuels and are mostly carbon dioxide. The combustion of fuel also releases nitrous oxide and methane. Agency vehicles are grouped by class; the first five vehicle classes include passenger vehicles and light duty trucks. Some of these vehicles have equipment attached or other modifications to the vehicle body. Additional vehicle classes include heavy-duty vehicles, such as snow plows, graders, and sweepers.


WSDOT's reach-alls are used to inspect bridges.

Facilities

WSDOT has over 1,030 buildings and structures across the state:

- Offices
- Maintenance facilities/shops
- Storage sheds for sand, salt, vehicles, etc.
- Radio shacks

Greenhouse gas emissions from these facilities come mostly from burning natural gas, but also from propane and diesel combustion for heat or running generators. These facilities also produce indirect emissions through the electricity they use. Both the direct and indirect emissions are predominately carbon dioxide, although small amounts of nitrous oxide and methane are released, as well.
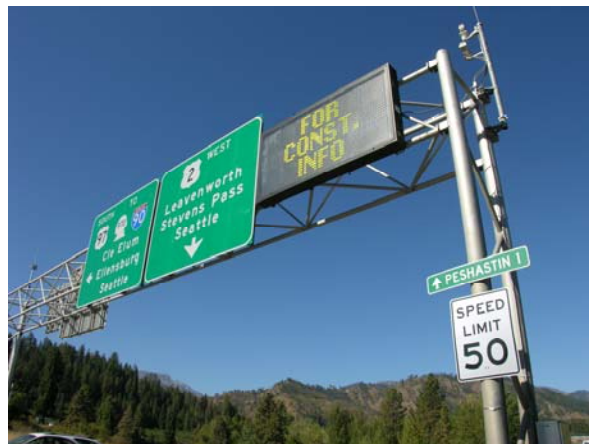
Variable message signs provide traveler information.

In addition, WSDOT leases building and office space. Some lease agreements include utility use in the lease payment. Only those facilities for which WSDOT pays the utility bill are included in this analysis.

Traffic services

In many places along our state highway system WSDOT operates traffic lights and street lights to improve traveler safety. In addition, cameras, variable message boards, and other equipment monitor the flow of traffic and provide information about traffic to both WSDOT staff and the public. The agency's traffic services program also operates rest areas throughout the state. All of this equipment requires electricity. Production of this electricity releases carbon dioxide, nitrous oxide, and methane.

This inventory includes only emissions released by the agency and does not include emissions released by the public traveling on the state highway system. Those emissions are captured in the Washington State Greenhouse Gas Inventory prepared by the Washington State Department of Ecology.

What data sources were used for this inventory?

Ferry fuel

WSDOT's Ferry Division provided fuel use by ferry.

Vehicle fleet fuel

WSDOT's Transportation Equipment Fund tracks vehicle use by data gathered at the gas pump (such as through the Voyager card system). The equipment fund provided gallons of fuel used by class for all classes. For classes 1 to 5, vehicle miles traveled was also supplied by vehicle model and year.

Snow plows are one of the many types of vehicles WSDOT owns and operates.

Utilities

Utility payments made in 2007 were extracted from the WSDOT Datamart. Search criteria are shown in Appendix A. The Energy Information Administration website lists average monthly utility prices. The values used are shown in Appendix B.

The Coleman Ferry Terminal uses district steam heat. Seattle Steam provided total emissions released during the generation of the steam energy used.

Emission factors and global warming potentials

This analysis uses emission factors and global warming potential factors given in The Protocol. See appendix C for emission factors used. Global warming potentials are shown Exhibit 4.

Emission factors determine the quantity of emissions released from a specified amount of fuel.

Global Warming potential compares the ability of a compound to act as a greenhouse gas to carbon dioxide's warming ability. Most often, inventory results are expressed in carbon dioxide equivalents (CO_2e), which take in account the global warming potential of different greenhouse gases.

Exhibit 4: Global Warming Potential[6]

Greenhouse Gas	Global Warming Potential
Carbon dioxide (CO_2)	1
Methane (CH_4)	21
Nitrous Oxide (N_2O)	310
Hydrofluorocarbons (HFCs)	120 to 11,700[7]
Perfluorocarbons (PFCs)	6,500 to 9,200
Sulfur hexafluoride (SF_6)	23,900

How were the results calculated?

Ferry fuel

Emissions were calculated by multiplying vessel fuel use by appropriate emission factors. Methane and nitrous oxide emissions were converted to CO_2e by applying the relevant global warming potentials. Emissions by vessel are listed in Appendix D.

Fleet fuel

Carbon dioxide emissions from the WSDOT vehicle fleet were calculated by multiplying the fuel use by the emissions factor. Methane and nitrous oxide emissions for vehicle classes 1-5 were calculated by applying an emissions factor based on the fuel type

WSDOT has maintenance facilities throughout the state.

and model year to the vehicle miles traveled. For all other equipment classes, methane and nitrous oxide emissions calculations are based on the quantity of fuel used and the emissions factors for construction equipment. Total emissions for each vehicle class are listed in Appendix E.

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[6] The Registry, *General Reporting Protocol*, May 2008, pg 168.

[7] Hydrofluorocarbons and Perfluorocarbons are both classes of compounds. When these emissions are evaluated, the global warming potential for the specific compound is used.

Facilities and Traffic Services – electricity, natural gas, propane, and heat oil

Utility use was estimated from utility payment amounts and average utility rates. Utility rates used include an adjustment to account for taxes included in the payments. Utility and tax rates used are listed in Appendix B.

Dividing the amount paid for utilities by the estimated utility rate provided the approximate quantity of energy used. Emission factors and global warming potential factors were applied to calculate emissions. To better understand the agency's emission sources, emissions were summed by subprogram, and subprograms were grouped into three categories. Most subprograms were assigned to Facilities because they were assumed to be paying utility bills for their facility. See Exhibit 5. Emissions by subprogram are in Appendix E.

Exhibit 5: Subprogram Categorization

Category	Subprograms
Facilities	OR, C1, D4, E1, F1, F2, F3, I1, I2, I3, I4. I6, I7, P1, P2, P3, P4, P5, P7, P8, P9, Q2, S2, T2, Z2
Traffic Services	M1, M2, M3
Ferry Shore-side Operation	X1, X2, X7

This method of calculating utility cost from utility payments deviates from the methods provided in The Protocol, which requires emissions to be based on actual utility use rather than estimated use. The method to estimate utility use for this 2007 inventory is the same methodology that has been used for the Sustainability Report WSDOT prepares in accordance with Executive Order 02-03, Establishing Sustainability and Efficiency Goals for State Operations. A discussion of why WSDOT estimated utility use from cost and deviated from the Protocol methodology is included in the Next Steps section of this report.

Rest areas are operated by WSDOT's Traffic Services group.

Because this method of calculating emissions from utility payments estimates WSDOT's greenhouse gas emissions, instead of reporting actual emissions, inaccuracies can enter in several places. A complete discussion of potential inaccuracies is in Appendix G.

AGENCY EMISSIONS

What were WSDOT's greenhouse gas emissions in 2007?

In 2007, WSDOT emitted approximately 264,686 metric tons CO_2e.

Exhibit 6 shows WSDOT's emissions for the calendar year 2007 by category. Scope 1 emissions are emitted when the agency burns fuel or otherwise directly releases greenhouse gases. Scope 2 emissions are released during the production of the electricity the agency uses.

Exhibit 6: Total Emissions[8]

Source	Scope 1 (MT CO_2e) Direct Emissions	Scope 2 (MT CO_2e) Indirect Emissions	Total Emissions (MT CO_2e)
Ferry Fleet	181,321	0	181,321
Vehicle Fleet	36,837	0	36,837
Facilities	7,015	6,746	13,762
Ferry Shore-side Operations	277	5,304	5,580
Traffic Services[9]	196	26,990	27,168
Total	225,645	39,040	264,668

Exhibit 7 shows the portion each of these five categories contributes towards WSDOT's overall greenhouse gas emissions.

Percentages in all charts may vary slightly because of rounding.

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[8] Numbers may not add exactly due to rounding.
[9] Traffic services includes traffic signals, stop lights, rest areas, and other roadside energy use.

Exhibit 7: Emissions by Category
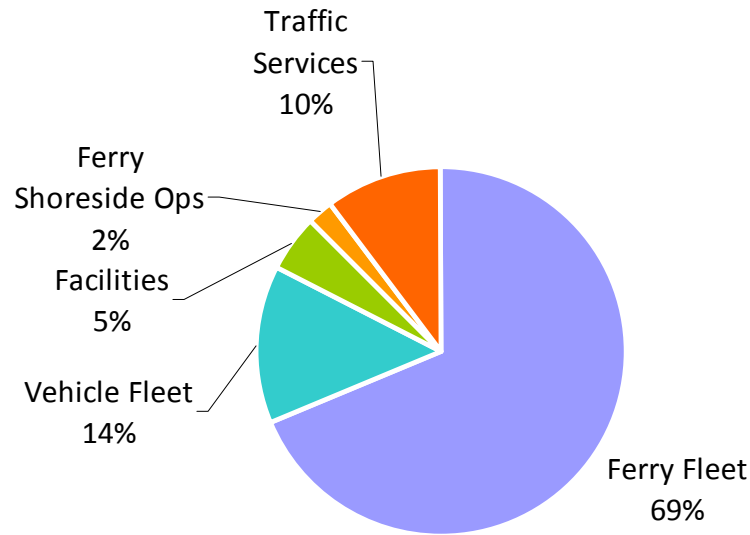
The ferry system, fleet and on-shore activities together, produces about 70 percent of the agency's emissions. The vehicle fleet is the next largest source releasing about 14 percent of the total emissions. The production of the electricity used throughout the state highway system is the next largest source with about ten percent of the total emissions. WSDOT's facilities are responsible for about five percent of agency emissions.

How do the scope 1 and scope 2 emissions compare?

Scope 1 emissions (emitted directly by the agency) account for about 85% of the emissions and are emitted primarily from the ferry fleet. The remaining 15% are Scope 2 emissions and emitted almost entirely in the production of the electricity used by the agency. Also included in the Scope 2 emissions is the steam purchased for the Coleman Ferry Terminal. The majority of the Scope 2 emissions result from traffic services.

Exhibit 8 shows the agency's emissions by scope, then each scope's emissions by category.

Exhibit 8: Emissions by Scope
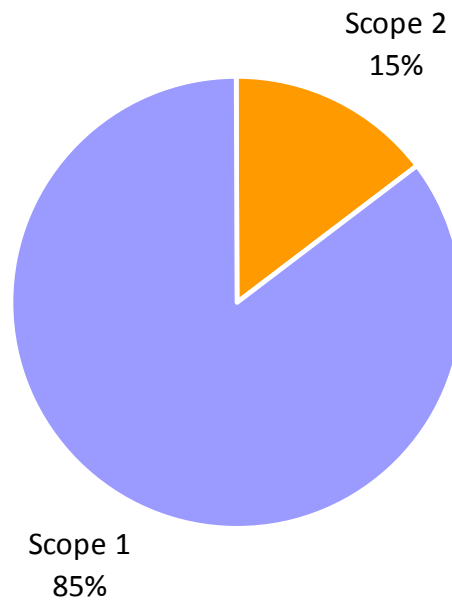
Scope 2
15%

Scope 1
85%

Scope 1 Emissions by Source

Facilities
3%

Vehicle Fleet
16%

Ferry Fleet
81%
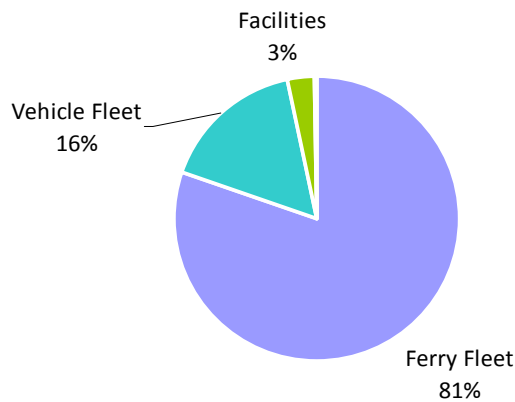
Scope 2 Emissions by Source

Facilities
17%

Ferry
Operations
14%

Traffic
Services
69%
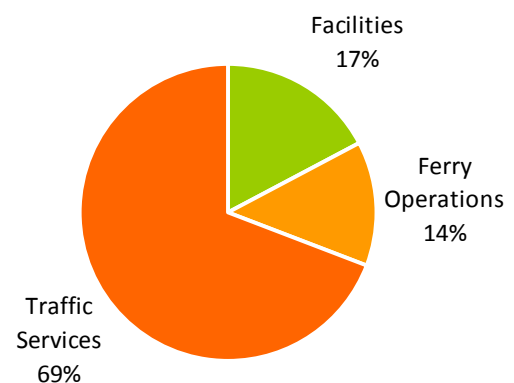
Which greenhouse gases does WSDOT emit?

Carbon dioxide makes up about 94 percent of the carbon dioxide equivalents WSDOT emits, see Exhibit 9. The remaining five percent of WSDOT's emissions reported in this inventory are methane and nitrous oxide. Although not included in this report, the agency also emits small amounts of refrigerants (hydrofluorocarbons, perfluorocarbons), which will be included in future inventories.

Exhibit 9: Emissions by Greenhouse Gas

Methane (CO2e) 1%

Nitrous Oxide (CO2e) 5%

Carbon Dioxide 94%
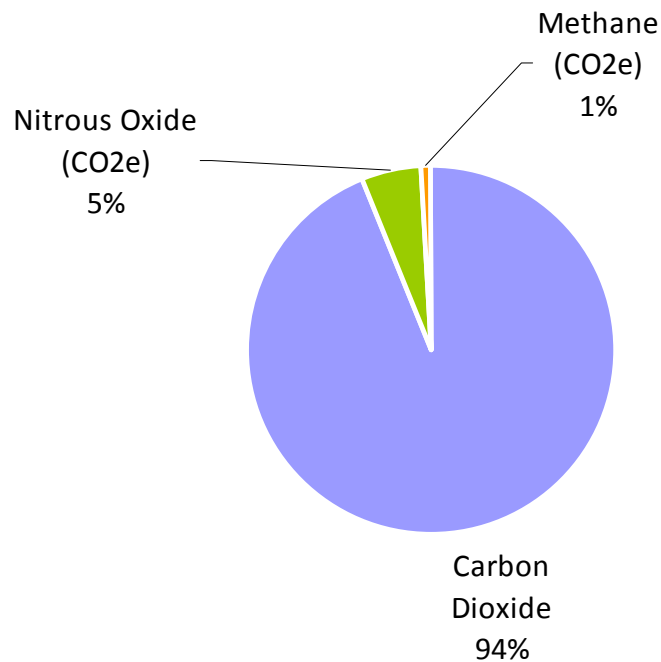
What do these results mean?

Because this is WSDOT's first emissions inventory, there is no baseline against which to compare this inventory. Likewise, WSDOT is among the first state agencies to prepare a comprehensive, so comparison to similar agencies is not possible.

This inventory can serve as a baseline for future inventories.

NEXT STEPS

What challenges were encountered in preparing this inventory?

The primary challenge in preparing this inventory was working with the utility data. In 2007, WSDOT made about 50,000 utility payments on over 5,000 accounts. While the utility providers bill WSDOT for its consumption of power, the actual units consumed at a specific facility, for a specific time period, are not captured and stored in a comprehensive manner.

The following questions describe challenges, next steps, and potential solutions.

How can the agency most efficiently collect utility use information?

WSDOT requested year-end summary information from many of the agency's utility providers. The information received from many of these providers was not in an electronic form; thus, using this data as the basis for the emissions calculations would require extensive data entry. In addition, hand entering data would greatly increase the likelihood of introducing errors.

Those utilities that provided information in electronic form did so in varying formats. Generally, the information for each account was provided on a separate worksheet in an Excel spreadsheet. Again, organizing the data would likely take significant effort.

To accurately and efficiently calculate emissions in the future, the agency will need to electronically retrieve utility use information.

Currently, the Northwest Region Facilities office uses Utility Manager Pro software to track utility. Each month a staff member enters data from the utility bills for the buildings they manage. Over the ten years this system has been in use, they have been able to show the reduction in utility use and cost savings from efficiency upgrades in the facilities they track. Although they enter the data by hand, this software has the ability to accept data electronically from some utility providers, e.g., Puget Sound Energy.

Eastern Region uses a Microsoft Access database to track utility use in their facilities. The data is entered by WSDOT staff as the bills are received.

Can WSDOT identify flat rate accounts and determine utility use on these accounts?

Conversations with several utilities revealed that WSDOT has flat-rate agreements with some providers. Instead of billing WSDOT based on use, the utility bills the agency the same amount every month (a flat rate). For some accounts, this rate includes equipment rental, as well. Some flat rate accounts are not metered.

Does the agency have information linking utilities' account number to account locations?

Utility providers were generally able to provide account location or description information.

Requests to utility companies for information proved that most of the numbers in the "Invoice Number" field in the agency's accounting system are actually account numbers. Program information, organization, work operation, and other identifiers are also recorded in the accounting system. Control section numbers provide location information for some, but not all, payments in the accounting system.

Is the information available to follow The Climate Registry's estimation procedure for leased space?

In addition to the buildings WSDOT owns, the agency also leases office space and will need to estimate utility use for leased spaces. The Protocol provides estimation methods to determine energy use in these facilities if utility data is not available. The estimation equation uses the total building area, the area leased, total building utility use, and building occupancy rate. Further research into leased spaces and lease agreements is currently being pursued.

How can we best deal with the unusual leases we have?

WSDOT has traditional leases – where the agency leases and uses the office space. But the agency also has some unusual lease agreements. For example, some agency staff work in the same space as consultants and costs are split by one party paying the utility costs as their share of the expenses. Again, further research into lease agreements should reveal the extent of these unusual agreements.

How can fuel used in vehicles be differentiated from fuel used in attached equipment?

The agency has a number of "dual use" vehicles that use fuel for equipment on board in addition to the vehicle operation. Sometimes this shows up with vehicles using two types of fuel, such as diesel for the vehicle and gasoline for the equipment. The agency's equipment fund is working to improve the data collection system for dual fuel vehicles.

Are there other sources of greenhouse gas emissions that this report has not addressed?

This emissions inventory has addressed only emissions from energy used. In addition to burning fuels that release greenhouse gases, WSDOT also uses refrigerants. While the quantities may be small, these compounds are potent greenhouse gases. Future agency greenhouse gas emission inventories will include refrigerants.

How would changes to the Washington State mandatory reporting requirement affect WSDOT?

The Washington State Department of Ecology has indicated that all vehicle fleets emitting over 2,500 MT CO_2 must report all fleet emissions beginning with 2009 emission. Changes to the entity-wide 10,000 MT CO_2e threshold have been considered. Any changes to this threshold would likely reduce the requirements on WSDOT to report emissions.

What are other states doing?

Other states, such as Oregon, Florida, and Massachusetts, have calculated emissions for a group of state agencies. These inventories were initiated at the state level, instead of agency level. All

three of these states used a simplified process, such as only including buildings over a certain size, and included multiple agencies in one effort.

Colorado State's executive branch is planning to report emissions through The Climate Registry. As their first step, they have purchased utility bill management software for their cabinet agencies (EnergyCAP). They expect co-benefits from using this software to include monetary savings up to ten percent from identifying billing errors, identifying facilities that will benefit from energy saving upgrades, and more accurate utility budgeting.

What does WSDOT need to consider for verification?

For verification, the agency will need to document where the data came from, i.e., how ferries or the Technical Equipment Fund gather their info.

When will WSDOT publish its next greenhouse gas emissions inventory?

WSDOT intends to continue reporting greenhouse gas emissions annually in order to track emissions trends, determine effectiveness of reduction efforts, and meet regulatory requirements.

WSDOT will be required under state law to report vehicle fleet emissions for calendar year 2009. The agency is also working to report all agency emissions for 2009 through The Climate Registry. These results will be available in 2010.

An inventory for 2008 will likely be prepared sometime during 2009.

REFERENCES

The Climate Registry, *General Reporting Protocol*, version 1.1, (May, 2008).

EPA, http://www.epa.gov/solar/energy-resources/calculator.html, accessed on 12/26/08.

Revised Code of Washington, Section 70.94.151, as amended 2008.

Washington State Department of Ecology, *Washington State GHG Inventory and Reference Case Projections, 1990-2020*, (December 2007).

Energy Information Agency, http://www.eia.doe.gov/.

APPENDIX A – DATAMART SEARCH CRITERIA

Filter Name	Filter Value
Calendar Year	2007
Object of Expenditure	EC02 (Natural Gas and Propane)
Object of Expenditure	EC03 (Diesel and Heating Oils)
Object of Expenditure	EC04 (Other Heating and Power Supplies)
Object of Expenditure	EC05 (Electricity)

APPENDIX B – 2007 AVERAGE MONTHLY UTILITY RATES

All rates are taken from the Energy Information Administration website and have been adjusted to include estimated tax rates:
- 6.5% for electricity
- 6.0% for natural gas
- 8.8% for propane
- 8.8% for heat oil

Electricity and natural gas rates are specific to Washington State.

Propane and heat oil are national averages. These rates were only given for January – March and October – December. The provided values were averaged to generate a rate for the missing months.

Diesel prices are averages for the West Coast.

2007 Average Monthly Utility Rates

Month	Electricity	Natural Gas	Propane	Heat Oil	Diesel
January	0.0667	1.2153	2.167	2.577	2.7616
February	0.0652	1.2396	2.197	2.662	2.76775
March	0.0664	1.2386	2.216	2.714	2.8055
April	0.0650	1.2454	2.380	3.020	2.9334
May	0.0639	1.2338	2.380	3.020	2.9285
June	0.0633	1.2793	2.380	3.020	2.95375
July	0.0653	1.2929	2.380	3.020	3.0218
August	0.0628	1.2764	2.380	3.020	3.01425
September	0.0652	1.2638	2.380	3.020	3.0015
October	0.0666	1.1988	2.375	3.098	3.2406
November	0.0679	1.0689	2.619	3.486	3.57225
December	0.0669	1.0698	2.708	3.584	3.4498

APPENDIX C – EMISSION FACTORS

All emission factors are taken from The Climate Registry's *General Reporting Protocol*, Version 1.1, May 2008.

Source	CO_2	CH_4	N_2O
Electricity	898.04 lb/MWh	19.13 lb/GWh	14.9 lb/GWh
Natural Gas	53.06 kg/MMBtU	5 g/MMBTU	0.1 kg/MMBTU
Gasoline - passenger vehicles	8.81 kg/gal	VMT based	VMT based
Gasoline - construction equipment	8.81 kg/gal	0.5 g/gallon	0.22 g/gallon
Diesel - construction equipment	10.15 kg/gal	0.58 g/gallon	0.26 g/gallon
Propane	5.74 kg/gal	11 g/MMBTU	0.6 g/MMBTU
Diesel - ships	10.15 kg/gal	0.26 g/gallon	0.74 g/gallon
Oil	10.15 kg/gal	11 g/MMBTU	0.6 g/MMBTU
Diesel for facilities	10.15 kg/gal	11 g/MMBTU	0.6 g/MMBTU

Other conversion factors used	
Propane	3.824 MMBTU/barrel
Oil	5.825 MMBTU/barrel
Barrel	42 gallons
MMBTU	10 therms

APPENDIX D – FERRY EMISSIONS BY VESSEL

Vessel Name	MT CO$_2$e
Wenatchee	17,650
Puyallup	16,442
Walla Walla	14,282
Spokane	13,470
Hyak	13,086
Yakima	11,892
Kaleetan	11,612
Tacoma	10,129
Chelan	9,623
Sealth	8,726
Elwha	7,601
Kitsap	7,171
Tillikum	6,264
Klahowya	5,880
Cathlamet	5,096
Kittitas	4,871
Issaquah	4,579
Evergreen State	2,869
Klickitat	2,231
Illahee	1,835
Rhododendron	1,540
Skagit	1,243
Quinault	1,079
Snohomish	812
Nisqually	798
Kalama	355
Hiyu	184
Total	**181,321**

APPENDIX E – EMISSIONS BY SUBPROGRAM

Subprogram	MT CO$_2$e
0R: Advance Right of Way Acquisition	6
C1: Information Tech - Business and Admin	48
D4: Capital Facilities Maintenance and Operations	8,677
E1: Technical Equipment Fund Operations	3
F1: Aviation Management and Support	50
F2: Airport Aid	4
F3: State Airports	11
I1: Mobility Improvements	1,669
I2: Safety Improvements	663
I3: Economic Initiatives Improvements	78
I4: Environmental Retrofit Improvements	4
I6: Regional Transit Authority Improvements	215
I7: SR 16 Tacoma Narrows Bridge Project	99
M1: Maintenance – Management and Support	195
M2: Maintenance – On State System	26,711
M3: Maintenance – Reimbursable Sales & Service to Others	281
P1: Roadway Preservation	18
P2: Structures Preservation	22
P3: Other Facilities Preservation	9
P4: Preservation Program Support	8
P5: Undistributed Costs – Bridge Inspection	924
P7: Undistributed Costs – Project Engineers	827
P8: Undistributed Costs – Direct Project Support Work orders	61
P9: Sales and Service to Others	64
Q2: Traffic Operations Program Operations	53
S2: Finance and Administration	68
T2: Planning, Data, and Research	180
X1: Ferries - Vessel Operations	21
X2: Ferries - Terminal Operations	3,981
X7: Ferries - Maintenance Management and Support	1,700
Z2: Local Programs Construction Off State System	1
Total	**46,651**

APPENDIX F – EMISSIONS BY VEHICLE CLASS

Vehicle Class: Name	MT CO$_2$e
01: Passenger Carrying Vehicles	3,201
02: Light Cargo Carrying Vehicles	1,249
03: Incident Response Vehicles	1,598
04: Light Vehicles w/Special Bodies	2,996
05: Pickup Trucks	9,213
06: Dump / Plow / Sander Trucks	10,419
07: Man lift & Digger/Derrick Trucks	1,850
08: Trucks w/Special Bodies	3,454
09: Earth Drilling Equipment	196
10: Trailers (Hydro Blaster)	0
11: Motor Graders	290
12: Cranes and Shovels	105
13: Front End Loaders	750
14: Rollers	11
15: Sweepers	446
16: Bulldozer	19
17: Tractor Attachments	252
19: Asphalt Equipment	60
20: Other Self-Propelled Equipment	121
21: Other Non-Self-Propelled	60
22: Snow Blowers	331
23: Ice & Snow Removal Attachments	0
25: Power Generation Equipment	218
Total	**36,837**

APPENDIX G – POTENTIAL ESTIMATION INACCURACIES

For this inventory, utility use was estimated based on utility payments and average utility costs. Although utility use accounts for only about 17 percent of the agency's emissions, potential inaccuracies are detailed here because this approach deviates from the approaches provided in The Climate Registry's General Reporting Protocol and is not approved for reporting through The Climate Registry or for complying with the reporting requirements in RCW 70.94.151.

This method can introduce inaccuracies in a number of places and WSDOT is currently unable to determine level of inaccuracies introduced through estimation.

- Any base rate included in the utility cost was not subtracted before the use was calculated – potentially resulting in over-reporting energy use.
- WSDOT has an unknown number of flat rate accounts. For these accounts WSDOT and the utility provider have agreed on a monthly charge.
    - Some of these flat rate accounts include equipment rental and/or servicing. This method would over report energy use on these accounts.
    - Some flat rate accounts are not dependent on utility use, rather WSDOT and the provider have agreed upon a set fee – estimated utility use could error on either side of the actual amount used.
- Using average statewide electric and natural gas rates will overestimate use where providers actual cost is higher and underestimate use in those areas with lower rates.
- For propane and heat oil, average state rates were not available; national averages were used. It is likely that national averages for these fuels are slightly higher than rates in Washington. This difference would cause the calculated quantities to be lower than the actual quantities used.
- For propane and heat oil, the national average rates were provided for January to March and October to December. For fuel purchased during the summer months, the average of the rates available was used.
- Comparing one propane provider's account summary to accounting records showed that tank rental is not coded as a utility payment. It was assumed that this is true for all propane providers. If this is not true, propane use would be overestimated.
- Diesel rates are averages for the West Coast.
- Most of the utility records extracted from the WSDOT accounting database included a recognizable provider name. About ten records came back with a provider that does not provide energy (for example a garbage service). These records were deleted based on the assumption that they were miscoded as energy payments.
- Under "Payee Name" several names came back that were not recognizable utility providers:
    - WSDOT
    - WSDOT Motor Vehicle Account (108)

o DW Not Required (data warehouse not required)

After discussion with WSDOT's Accounting Services, it was determined that a number of these were payments were identifiable as internal transfers of funds. "JV" as a prefix in the "Document Number" field indicates a journal voucher or internal transfer; "PV" indicates a payment voucher or payment made directly to a vendor. Payments identified as vendor payments were included in the inventory calculations; those identified as internal transfers were not.

- Future inventories based on utility use data will eliminate potential inaccuracies from estimation.